

a perfectly satisfactory safeguard. On the other hand, I have recently learned with surprise that carbon bisulphide fumigation has been found ineffective in at least one herbarium of great size. This leads to the conclusion that, whatever method is adopted, success must come largely from care and thoroughness in its application. The danger from insects must be considerably greater in old buildings, and reduced to a minimum in new ones of modern construction with concrete floors and metal shelves. In any case, scrupulous neatness should be maintained in the surroundings of an herbarium. No accumulations of dust should be allowed on tables or shelves; dust-filled cracks in woodwork should be sterilized; all mouldy, imperfectly dried, or otherwise useless material should be promptly removed; and finally special attention should be taken to prevent the insect life in packages of stored duplicates, etc.

As efficient as the carbon bisulphide method has proved, its annoyance and danger are such as to stimulate investigations in other directions and at the suggestion of Professor W. E. Burke of the Engineering Department of Harvard University, some interesting experiments are being undertaken in the use of vacuum as a means of destroying insects. If it can only be demonstrated, that insects cannot survive in ordinary vacuum or, to speak more precisely, in an extremely attenuated atmosphere, much may be hoped from such a substitute for fumigation. Surely no other penetrating fatal agent could combine more happily so many desirable negative traits, such as perfect freedom from odor, poisonous fumes, and bleaching action, as well as from explosive, inflammable, or other qualities likely to render the herbarium rooms disagreeable or dangerous.

GRAY HERBARIUM.

A NEW KOBRESIA IN THE AROOSTOOK VALLEY.

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ON June 29, 1899, the Josselyn Botanical Society of Maine spent the forenoon on the south bank of the Aroostook River at Fort Fairfield, Maine; and among other interesting plants collected by them was a slender wiry sedge first noticed by Miss Mabel P. Cook near the little spring above the long bridge over the Aroostook River. At

the time, a few specimens were prepared by the writer and the plant was laid aside for future study. The material was over-mature, with an inclination to shell; but the small oblong fruits were so unlike those of any known *Carex* of the *Elongatae* (to which group the plant seemed to have affinity) that it was recently described by the writer as a unique species, *Carex elachycarpa*.¹

Subsequent trips to Fort Fairfield were too early or too late in the season for the local sedge to be found in good condition, until in early July, 1902, Messrs. J. Franklin Collins, Emile F. Williams and the writer spent a week at Fort Fairfield. Among the important objects of the first afternoon's excursion was, naturally, a visit to the original station of *Carex elachycarpa*. There, in the rain, we searched the seepy shore where Miss Cook had first called attention to the plant, and although we crept on hands and knees amongst the abundant *Triglochin palustris*, *Calamagrostis neglecta*, and *Juncus alpinus*, the only plant found resembling the little-known *Carex elachycarpa* was a tall slender and immature state of *Carex interior*. This result was of course most discouraging and it even led us against our own convictions to wonder if, after all, the material from which *Carex elachycarpa* had been described could have been an aberrant state of *Carex interior*. With this unsatisfactory ending of our first afternoon's work we returned to the hotel; but early next morning we visited a similar seepy and sandy spot on the north bank of the river. There almost immediately our discouragement was banished, for, mingled with *Carex interior*, *Triglochin maritima*, and *Juncus balticus*, was the wiry plant with the rigid spikes and characteristic little oblong subterete fruits of *Carex elachycarpa*. Abundant material in various stages of development was secured, and the remainder of the morning devoted to further exploration of the north bank of the river.

In the afternoon while Mr. Williams and the writer were putting up the morning's collection, Mr. Collins amused himself by studying the structure of the rediscovered *Carex elachycarpa*. This diversion, quite innocent in its motive, soon resulted in the investigator asking seriously "Is this a *Carex* after all?" An improvised dissecting microscope was soon constructed by fastening a Coddington lens on the blade of a partially open knife, and a series of dissections of the

¹ Proc. Am. Acad. xxxvii. 492, figs. 133, 134 (1902).

younger material quickly showed that our plant had the flower-structure not of *Carex*, but of the Himalayan and high-northern genus *Kobresia*.

In *Carex* the ovary is surrounded by an indehiscent closed pouch, the *perigynium* or *utriculus*. In *Kobresia* the ovary is wrapped about by a concave glume which is open on one side or with the margins merely united at the base. In *Carex elachycarpa* the glume has the margins united at the very base, but the mature achene protrudes between the free margins of the glume, and appears strongly exserted. On this account it may easily be mistaken for the perigynium of a *Carex* and only close examination will reveal its true nature. There is no question, however, that *Carex elachycarpa* has its affinities with *Kobresia*, a genus which is little known in North America; but like many of the species referred to *Kobresia* *Carex elachycarpa* is a problematic plant.

Besides the genus *Carex* the members of the *Cariceae* have been grouped by different modern authors into various ill-defined genera varying with the personal equation from two to five¹ while by early authors most of the better known species have been united with *Carex*. By Bentham & Hooker² four genera — *Kobresia*, *Hemicarex*, *Schoenoxiphium*, and *Uncinia* (besides *Carex*) were recognized, though *Kobresia* was placed in the *Sclerieae*. In his monograph of *Hemicarex* and its allies, in 1883, Mr. C. B. Clarke recognized³ the same four genera, although he pointed out that they are based on somewhat artificial characters and that the original "*Kobresia* had the glume of the female flower concave, open or with the margins slightly connected near the base; *Carex* had a complete utricle. But in the considerable number of species now known of *Kobresia* (including

¹ Rafinesque in *The Good Book* — Number 1, or *Amenities of Nature* (1840) p. 23-24, says in his discussion of "The natural family of Carexides," "Yet they persist in deeming this vast assemblage a Genus! instead of a family! . . . As I possess nearly 240 sp. of this group, American, Siberian and European, and have always deemed it a family, I may at last venture to split it into 22 Genera perfectly distinct"; yet it is surely disconcerting to present-day students of *Carex* to find that in the "perfectly distinct" genera of Rafinesque *Carex cephalophora* appeared as a "type" of both *Carex* and *Diemisa*; *C. crinita* as a "type" of both *Diemisa* and *Neskiza*; *C. lacustris* of both *Carex* and *Anithista*; *C. oligocarpa* of *Olotrema* and *Deweya* "(or *Meltrema* if Dewey has a G[enus].)"; and *C. pubescens* of *Enditria* and *Diemisa*. The excessively artificial nature of Rafinesque's genera is further shown when we find *Carex flava*, *Oederi*, and *viridula* (now often considered one species) as types of three "perfectly distinct" genera.

² *Gen. Pl.* iii. 1071, 1072.

³ *Journ. Linn. Soc.* xx. 374.

Hemicarex, Benth.), this character is found to become illusory by degrees: the margins of the glume are exceedingly thin and brought close together; whether they are actually connate for more or less than half the length of the glume appears a matter of very slight importance to establish a genus upon, and from the exceeding fragility of the scarious margins it is exceedingly difficult to determine; different female flowers from the same plant, treated with every care under water, give different results."

In 1887 Pax essentially followed ¹ Clarke's treatment, but separated *Elyna* from the *Kobresia* of Clarke. But in 1894 Clarke united ² *Kobresia*, *Elyna* and *Hemicarex*, a course which seems far more satisfactory than the earlier one of separating them generically on illusory characters. In this treatment Clarke recognized 20 species of *Kobresia*: 13 confined to the Himalaya of northern India, occurring mostly at altitudes of 10,000 to 16,000 feet from Kashmir to Bhutan; 2 crossing the Himalaya from India to western Tibet; 1 in the Himalaya of northern India and western Tibet, and the Hindukush Range of Afghanistan; 1 extending from Tibet to Transbaikalia (Dahuria of Pallas); 1 from the Himalaya of northern India and western Tibet to Siberia and the Caucasus; and 2 of general arctic distribution, extending south in the north temperate regions to the Altai, Caucasus, Alps, and Pyrenees, and in the Rocky Mountains to Colorado.

Of the 20 known species of *Kobresia*, 19 have 3-cleft styles and trigonous achenes, and usually (if not always) male flowers with 3 stamens. In a single Tibetan species, *K. macrantha*, Boeckeler, the style is 2-cleft and the achene flat, not trigonous; and for this species differing from all others in these two characters Mr. Clarke has proposed the sectional name *Pseudokobresia*.

It is of great interest, therefore, to find in studying *Carex elachycarpa* of the Aroostook Valley that while it has the general floral structure of most *Kobresias* it has only 2 stamens and 2 style-branches instead of 3, and a compressed subterete, instead of trigonous, achene. Thus the Aroostook Valley plant most closely approaches in its characters the unique *Kobresia macrantha* of central Asia, but from that species it is very clearly distinct in its elongate narrow

¹ Engl. & Prantl, Nat. Pflanzenf. ii. Ab. 2, 121-122.

² Hook. f. Fl. Brit. Ind. vi. 694-699.

spike, subterete (only obscurely flattened) small achene, and in the male flowers with only 2 scarcely exerted stamens.

Differing from most other species in its 2-cleft style and from them all in its subterete achene and apparently in its 2 stamens, *Carex elachycarpa* might seem worthy generic separation from the essentially Himalayan *Kobresia*. But in view of the occurrence in *Carex* of either 2 or 3 style-branches and of either trigonous, subterete or strongly compressed achenes; in *Eleocharis* of terete or trigonous achenes; and especially in view of the subspathiform glume of *Carex elachycarpa* the plant is best treated as a unique *Kobresia*; and its discovery in northern New England suggests that further exploration may show that this remarkable genus is more generally represented in America than has been supposed.

From our more complete knowledge of the Aroostook River plant and its affinities it should be redescribed as

KOBRESIA elachycarpa. Densely tufted; the wiry compressed culms 2 to 5.5 dm. high, scabrous above; leaves flat (1 to 2 mm. wide), rather stiff, ascending, about half as long as the culms; spikes 1 to 2.5 cm. long, of 2 to 7 mostly remote appressed-ascending spikelets; spikelets either staminate (clavate), androgynous (staminate above, with 1 to several pistillate flowers below), or pistillate throughout (ovoid); bracteole (corresponding to the "scale" of *Carex*) ovate, concave; glume (corresponding to the "perigynium" of *Carex*) ovate, subspathiform, connate at base, emarginate at tip, more or less marked with green and brown: style with 2 long branches, the elongate base becoming chartaceous dark brown and subpersistent, finally separating from the truncate oblong subterete nerveless pale achene (1.2 to 1.5 mm. long): stamens 2, scarcely exerted, the anthers much exceeding the filaments.—*Carex elachycarpa*, Fernald, Proc. Am. Acad. xxxvii. 492, figs. 133, 134 (1902).—MAINE, wet sandy banks of Aroostook River, Fort Fairfield, June 29, 1899 (*M. P. Cook, E. L. Shaw & M. L. Fernald*), July 15, 16, 1902 (*J. F. Collins, E. F. Williams & M. L. Fernald* in *Plantae Exsiccatae Grayanae* no. 115).

GRAY HERBARIUM.